

RESEARCH, DEVELOPMENT & TECHNOLOGY TRANSFER QUARTERLY PROGRESS REPORT

Wisconsin Department of Transportation
DT1241 02/2011

INSTRUCTIONS:

Research project investigators and/or project managers should complete a quarterly progress report (QPR) for each calendar quarter during which the projects are active.

WisDOT research program category: <input type="checkbox"/> Policy research <input type="checkbox"/> Other		<input checked="" type="checkbox"/> Wisconsin Highway Research Program <input type="checkbox"/> Pooled fund TPF#	Report period year: 2011 <input type="checkbox"/> Quarter 1 (Jan 1 – Mar 31) <input type="checkbox"/> Quarter 2 (Apr 1 – Jun 30) <input checked="" type="checkbox"/> Quarter 3 (Jul 1 – Sep 30) <input type="checkbox"/> Quarter 4 (Oct 1 – Dec 31)
Project title: Aesthetic Coatings for Bridge Components			
Project investigator: Dr. Al Ghorbanpoor		Phone: 414-229-4962	E-mail: algh@uwm.edu
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WisDOT contact: Travis McDaniel		Phone: 608-266-5097	E-mail: travis.mcdaniel@dot.state.wi.us
WisDOT project ID: 0092-11-07	Other project ID:	Project start date: 10/21/2010	
Original end date: 10/20/2012	Current end date: 10/20/2012	Number of extensions: 0	

Project schedule status:

☒ On schedule ☐ On revised schedule ☐ Ahead of schedule ☐ Behind schedule

Project budget status:

Total Project Budget	Expenditures Current Quarter	Total Expenditures	% Funds Expended	% Work Completed
\$145,000.00	\$22,000.00	\$36,000.00	25%	30%

Project description:

The objectives of this study are to investigate methods and products that may be used in the aesthetic and protection coating of bridge components and to develop a guideline for cost-effective bridge coating practices. It was envisioned that a series of coating systems for both steel and concrete would be identified and tested in the laboratory to evaluate their performance under simulated environmental conditions that are similar to those experienced by bridge components in Wisconsin. After conducting a preliminary investigation and holding discussions with the Project Oversight Committee (POC), it was approved by the POC that the focused should be placed on evaluation of only steel materials due to the extensive nature of the required investigation and scope of the current study. Wisconsin bridge sites, where coating failures and problems have occurred, will be visited to identify and evaluate the structural details and other factors that have contributed to such coating failures. Upon completion of the testing and evaluation program, guidelines and specifications language will be developed for selection, application, and maintenance of such coating materials. Also, recommendations will be made to WisDOT for implementation of the results of this study.

Progress this quarter (includes meetings, work plan status, contract status, significant progress, etc.):

During this quarter the research staff submitted an interim report to the POC. The interim report consisted of the results of a literature review, detailed results of a survey/questionnaire effort that was made to acquire information from various WisDOT and other state DOTs regarding coating application, and an updated work plan. This interim report was reviewed by the POC who provided suggestions on the work plan. On August 25, 2011, a meeting was conducted at UWM with the members of the POC to finalize the work plan and testing procedure. At the meeting, the research staff made a formal presentation to the POC to present the results of Tasks 1 and 2 as well as the work plan for the remaining duration of the study. It was determined that the updated work plan will include testing coating system applied to new steel only. The concrete coatings will be evaluated in a separate study. A final work plan and testing procedure was submitted and approved by the POC. The final work plan will include testing 12 coating systems, instead of the 10 systems that were proposed initially, for new steel application. The specific coating systems have been determined in the finalized work plan. There was also a slight modification to the testing program to accommodate the new 12 coating systems. A copy of the approved work plan is presented at the end of this quarterly progress report.

Paint manufactures have been contacted and are in the process of delivering the specific coating systems that will be used for testing. Test panels have been purchased and are in the process of being prepared for coating application. A meeting was set up with the President of ACME Galvanization, Inc to visit their facilities and to have some test panels galvanized for initial evaluation. Several test panels were galvanized by ACME to make sure they will be suitable for our test program.

A new bridge (constructed in 2011) with aesthetic railing was identified in Tomahawk. A field visit was conducted on this bridge to gather information on the structural details of the aesthetic railings. During this visit the coating systems for steel and concrete were also examined.

Anticipated work next quarter:

The research staff will continue the preparation of the test panels. After proper surface preparation, the coating systems will be applied to the panels per recommendations of the manufacturers and WisDOT. After application of the coating systems, the approved test program will be started. During the testing phase, the coated samples will be subjected to two different tests. One test consists of UV/Prohesion/Freeze cycles and the other consists of Xenon arc testing. The test panels will be evaluated every two weeks for the effects of the UV/Prohesion/Freeze test and every week for the effects of Xenon arc testing. The bi-weekly and weekly evaluation will include measuring changes in color and gloss, rust creepage, holidays, dry film thickness, and scratch hardness for all test samples.

Circumstances affecting project or budget:

None.

Attach / insert Gantt chart and other project documentation

Quarters/Tasks	1	2	3	4	5	6	7	8
1. Literature Review	<div><div></div><div></div></div>							
2. Survey	<div><div></div><div></div></div>							
3. Interim Report	<div><div></div><div></div></div>							
4. Laboratory Testing			<div><div></div><div></div></div>					
5. Future Research						<div><div></div><div></div></div>		
6. Guidelines/Specs						<div><div></div><div></div></div>		
7. Draft Final report						<div><div></div><div></div></div>		
8. Final Report							<div><div></div><div></div></div>	

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Staff receiving QPR:	Date received:
Staff approving QPR:	Date approved:

Test Program
(Approved by POC on September 22, 2011)

Aesthetic Coatings for Bridge Components

WHRP Project # 0092-11-07

By

Al Ghorbanpoor and Zan Leppi
University of Wisconsin-Milwaukee

September 26, 2011

Introduction

To meet the requirements of the current WHP study entitled “Aesthetic Coatings for Bridge Components,” the research team submitted a proposal on September 14, 2011 to the Project Oversight Committee (POC) and WHP to seek approval for the proposed testing program to be performed during the remaining term of this study. The proposal included two options which were both limited to testing coating systems for only new steel applications. The proposed options included a testing program of either 10 or 12 coating systems under two color schemes. The program as approved by the POC includes the 12-coating system option that consists of a slightly smaller number of test samples for the Xenon and Mandrel testing components. Through a correspondence on September 22, 2011, the POC forwarded to the research team a final approval for the test program as detailed below.

Approved Coating Systems and Test Program

The following table shows 12 coating systems for new steel applications, along with the number of samples, and the type of tests that will be performed on these coating systems. A description of each coating system is shown in appendix “A”. There will be 5 samples per coating system for the UV/Prohesion/Freeze tests (Alternate ASTM D5894), and 2 samples per coating system for Mandrel testing. For Xenon testing, there will be 3 samples per coating systems tested with the following exception. The top-coats for coatings systems #A and #M and for #C and #N are the same so we will achieve the same results by performing tests on only coating systems #A and #C. Accordingly, we will eliminate the Xenon tests for coating systems #M and #N, to meet the space limitation of the Xenon testing equipment. For all UV/Prohesion/Freeze and mandrel tests, the Federal Color Number (27038) black will be used. For the Xenon tests, the Federal Color Number (27038) black and Federal Color Number (15092) blue will be used. Accordingly, a complete Xenon testing program of a minimum of 1,000 hours will be performed for samples coated with each selected color.

Approved 12 Coating Systems

System Type and #	Number of Systems	# of 3x6x1/8 in. Samples for UV/Prohesion/Freeze Testing (Alternate ASTM D5894)	# of 2x2x1/8in. Samples for Xenon Testing (ASTM G155)	# of 4x6x1/32in. Samples for UV/Prohesion/Freeze Mandrel Testing²
3-Coat Polyurethane (#A, #C, #Y)	3	15	9	6
3-Coat Fluoropolymer (#B, #Z)	2	10	6	4
2-Coat (#F, #O)	2	10	6	4
Galvanized Paint (#M, #N, #X)	3	15	3 ¹	6
Galvanized Powder (#AA, #AB)	2	10	6	4
Total	12	60	30	24

¹ Tests applies to coating system #X only. Note that top coats are the same for coating #A and #M and for #C and #N.

² 2 samples per coating system will be tested under the Mandrel tests.

Appendix "A"
(Description of Coating Systems)

3-Coat Polyurethane Systems

Coating #	Manufacture	3-Coat System	Primer /DFT(mils)	Intermediate Coat /DFT(mils)	Top Coat /DFT(mils)
A	Sherwin Williams	Polyurethane	Zinc Clad III /(3-6)	Macropoxy 646 /(3-10)	Acrolon 218 HS /(3-6)
C	Carboline	Polyurethane	Carbozinc 859 /(3-5)	Carboguard 888 /(3-5)	Carbothane 133LH /(3-5)
Y	PPG	Polyurethane	Amercoat 68HS /(3)	Amercoat 399 /(4-8)	Amercoat 450H /(2-5)

3-Coat Fluoropolymer Systems

Coating #	Manufacture	3-Coat System	Primer /DFT(mils)	Intermediate-Coat /DFT(mils)	Top-Coat /DFT(mils)
B	Sherwin Williams	Fluoropolymer	Zinc Clad III /(3-6)	Macropoxy 646 /(3-10)	Fluorokem /(2.5-3)
Z	Carboline	Fluoropolymer	Carbozinc 859 /(3-5)	Carboguard 888 /(3-5)	Carboxane 950 /(2-3)

2-Coat Systems

Coating #	Manufacture	1st Coat/DFT(mils)	2nd Coat /DFT(mils)
F	Carboline	Carbozinc 859 /(5-7)	Carboxane 2000 /(7)
O	Sherwin Williams	Corothane I Galvapak Zinc /(3-4)	Polysiloxane XLE-80 /(3-7)

Galvanized Systems with Paint Coats

Coating #	Manufacture	Tie-Coat/DFT(mils)	Top-Coat/DFT(mils)
M	Sherwin Williams	Macropoxy 646 /(2-4)	Acrolon 218 HS /(2-4)
N	Carboline	Galoseal WB /(0.5-1)	Carbothane 133LH /(3-5)
X	Wasser	MC-Ferrox B 100 /(3-5)	MC-Luster 100 /(2-4)

Galvanized Systems with Powder Coat

Coating #	Manufacture	Tie-Coat/DFT(mils)	Top-Coat/DFT(mils)
AA	Sherwin Williams	EAS6-C000 Epoxy /(1.8-3)	AAMA 2605 Fluoropolymer /(2-3)
AB	Sherwin Williams	EAS6-C000 Epoxy /(1.8-3)	AAMA 2604 Polyester /(2-3)